# CLEANTEX

Clean and Innovative Textiles Strategy for Circular Economy

## MODULE 2
## Eco-design for circular economy

# Unit 2.2
# Methodologies and Tools

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In this lesson you will find the methodologies and tools that can be useful in the field of Eco-design and for the circular economy methodology.

To understand the circular economy, first is strictly necessary to understand what kind of economy is the current one and the one that predominates in the market. An economy based on 'take-make-dispose' is called as linear economy. The approach of linear economy involves the process of collection of raw material for transformation into finished goods and distribution to the customer until they are accumulated as waste. Volume of products manufactured is very high in this economy. The economic model established in most parts of the world is the linear. The traditional supply chain framework is also considered as an approach based on the linear flow of materials and fails to include both environmental aspects and management of the end-of-life phase of products. Linear economy is a simple one-directional system:

- Produce
- Consume
- Throw away

Linear economy causes an excessive generation of waste, pollutants and excesses that can have very important consequences for our environment. We are already experiencing these effects and the consequences may alter the future of future generations[1].

Regarding textile sector, this sector has one of the highest environmental impacts globally, mainly due to its high carbon and water footprint.

The transition to the Circular Economy (CE) is important in order to be environmentally friendly, therefore the aim of Circular Economy is to break with the rigid and straightforward concept of the linear economy to start applying this circular model, which aims to turn waste into new resources, among other milestones. CE is a new paradigm shift where the future of work goes hand in hand. Thus, CE is a new system that allows to design, make, and use things respectfully within the planetary boundaries. CE is based on three principles:

- Eliminate
- Circulate
- Regenerate

At this point, circular economy gives us the tools to tackle climate change and biodiversity loss together, while addressing important social needs. The following phases close the loop of CE[2]:

- Design out waste & pollution: The first principle of the circular economy is to eliminate waste and pollution. Currently, our economy works in a take-make-waste system. We take raw materials from the Earth, we make products from them, and eventually we throw them away as waste. Much of this waste ends up in landfills or incinerators and is lost. This system cannot work in the long term because the resources on our planet are finite.
- Maximise the lifespan of products and materials: The second principle of the circular economy is to circulate products and materials at their highest value. This means keeping materials in use, either as a product or, when that can no longer be used, as components or raw materials. This way, nothing becomes waste and the intrinsic value of products and materials are retained.
- Regenerate Natural Systems: The third principle of the circular economy is to regenerate nature. By moving from a take-make-waste linear economy to a circular economy, we support natural processes and leave more room for nature to thrive. A circular economy avoids the use of non-renewable resources and preserves or enhances renewable ones, for instance by returning valuable nutrients to the soil to support regeneration or using renewable energy as opposed to relying on fossil fuels.

The cycle of Circular Economy, Step by step is the following:

- Restorative and regenerative by design.
- Keep products, components and materials at their maximum utility for as long as possible.
- Continuous cycle that preserves and improves natural capital.

 

- Minimise systemic risks by managing finite reserves and renewable flows.
- Optimises the use of resources.
- And it is important to remark that CE works effectively on any point in the value chain.

To apply CE is required to change the business model perspective, rethink the model to become sustainable in all ways possible. Thus, Re-Thinking Progress' explores how through a change in perspective we can re-design the way our economy works - designing products that can be 'made to be made again' and powering the system with renewable energy. It questions whether with creativity and innovation we can build a restorative economy[3].

it is essential to know the methodology to be able to improve the value chain, it is also needed to communicate the best practices to create a background, others will apply the same good environmental practices or even improve them. Therefore, to know the value chain and their environmental impacts Life Cycle Assessment (LCA) methodology can be a good option, it is a Standardized methodology for quantifying the environmental impact of products, processes and services.

To share and communicate, eco-labelling schemes is a useful way because it is an Environmental communication strategy, and voluntary tools to inform customers and consumers.

A valuable tool is the LCA methodology. LCA is based on the ISO standard framework for LCA: 14040 and ISO 14044, as well the recommendations of the International Life Cycle Data System (ILCD) Handbook.

Four interrelated stages are followed to apply LCA methodology[4]:

- Phase I, Goal & Scope: Is the phase where the system, system boundaries and functional unit (reference unit) and objectives are defined.
- Phase II, Life Cycle Inventory: The phase where the data is collected to quantify the relevant inputs (e.g. material inputs) and outputs (e.g. air emissions) that system considered.
- Phase III, Life Cycle Impact Assessment (LCIA): Where the inventory is connected with specific environmental impact categories and indicators.
- Phase IV, Interpretation: This phase goes hand in hand with the other 3 phases, is the compilation of findings from LCI and LCIA, Interpretation phase provide the conclusions and recommendations.

This methodology studies the entire value chain, from inputs to outputs:

- Inputs: These are the consumptions necessary for our product to succeed, materials, water, energy, necessary materials, etc.
- Outputs: Product, services and the emissions and wastes to the environment.

Establishing the boundary limits the scope of the project and thus the time and effort needed to collect information on the inputs and outputs.

Therefore, to obtain a product or services we need to get:

- Procurement of raw materials
- Carrying out the processing to obtain the product or service.
- Transporting the product or things to do the service correctly.
- Time of use of the product or service.
- End of life of the product.

Some wastes have different ways of returning to the value chain such as recycling (back to raw material), remanufacturing or reuse. If this is not possible, waste will go to incineration or landfill.

 

Regarding scope of the project there are different options:

- Gate-to-gate the LCA focuses only at one value-added process in the entire production chain. Gate-to-gate modules may also later be linked in their appropriate production chain to form a complete cradle-to-gate evaluation.
- Cradle-to-gate is an assessment of a product life cycle from resource extraction (cradle) to the factory gate (i.e., before it is transported to the consumer). The use phase and disposal phase of the product are omitted in this case.
- Cradle to grave covers the range from extraction of raw materials from the earth to manufacturing, product use and recycling/disposal at the end.
- Cradle-to-cradle in this case the scope closed the loop production. It is a specific kind of LCA assessment, where the end-of-life disposal step for the product is a recycling, reusing or remanufacturing process. It is a method used to minimize the environmental impact of products by employing sustainable production, operation, and disposal practices and aims to incorporate social responsibility into product development.

The Functional Unit is fundamental to define precisely what is being studied, quantifies the service delivered by the system, provides a reference to which the inputs and outputs can be related, and provides a basis for comparing/analysing alternative goods or services[4].

Concerning circularity methodology, is relevant to highlight the Material Circularity Indicator (MCI)[5]. This tool allows companies to identify additional, circular value from their products and materials, and mitigate risks from material price volatility and material supply.

MCI measures how restorative the material flows of a product, which can be aggregated up to product portfolio, and even further up to company level. Complementary indicators allow additional impacts and risks to be taken into account. The indicators may be used by product designers, as well as for internal reporting, procurement decisions, and the evaluation or rating of companies.

Thus, six principles are the basis of the restoration of material flows at product:

i) Sourcing biological materials from sustained sources[5]

ii) Using feedstock from reused or recycled sources

iii) Keeping products in use longer (e.g., by reuse/redistribution/increase durability)

iv) Reusing components or recycling materials after the use of the product

v) Making more intensive use of products (e.g. via service, sharing or performance models)

vi) Ensuring biological materials remain uncontaminated and biologically accessible

To finish with the unit Methodologies & Tools of the module 2, it is expected to highlight the importance of the different types of ecolabeling systems

Basically, an ecolabel is a label which identifies overall environmental preference of a product (e.g. good or service) within a product category based on life cycle considerations. In contrast to a self-styled environmental symbol or claim statement developed by a manufacturer or service provider, an ecolabel is awarded by an impartial third party to products that meet established environmental leadership criteria.

Ecolabelling allows the identification of products or services that have proven to be environmentally preferable within a specific category and specifically refers to the provision of information to consumers on the relative environmental quality of a product[7]. There are many different environmental performance labels and declarations being used or contemplated around the world.

Regarding ecolabel types[7]:

- Type I: It is a voluntary, multiple criteria based, third party program that awards a license which authorises the use of environmental labels on products indicating overall environmental preferability of a product within a product category based on life cycle considerations. Some of this Ecolabels are EU

 

Ecolabel, Blue Angel, Nordic Swan or DGQA, this type of ecolabel is based on the ISO standard framework for LCA: 14024 ISO.

- Type II: It is an informative environmental self-declaration claim. This type of ecolabel is based on the ISO standard framework for LCA: 14021 ISO.
- Type III: It is voluntary programs that provide quantified environmental data of a product, under pre-set categories of parameters set by a qualified third party and based on life cycle assessment and verified by that or another qualified third party. This type of ecolabel is based on the ISO standard framework for LCA: 14025 ISO.

* Examples of the LCA and CE can be found in the MOOC presentation and the related recording of this module nº2: Eco-design for circular economy.

 

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